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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Wei
Serial No.:	10/736,921
Filed:	December 16, 2003
Group Art Unit:	1753
Examiner:	Mayekar, Kishor
Title:	MULTI-LAYERED PHOTOCATALYST/THERMOCATALYST FOR IMPROVING INDOOR AIR QUALITY

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

APPEAL BRIEF

Dear Sir:

Appellant submits this Appeal Brief pursuant to the Notice of Appeal filed August 14, 2007. All appeal fees were paid with the filing of Appellant's first Appeal Brief on September 7, 2006. Any additional fees or credits may be charged or applied to the Deposit Account No. 03-0835 in the name of Carrier Corporation.

Real Party in Interest

The real party in interest is Carrier Corporation, the assignee of the entire right and interest in this Application.

Related Appeals and Interferences

The subject application was previously appealed on 7 July 2006 and an Appeal Brief was filed on 7 September 2006. The Examiner reopened prosecution in response to the Appeal Brief. Additionally, commonly owned co-pending application 10/736,922, which is also related to photocatalysts, is also under appeal with the same examiner.

Status of Claims

Claims 23 and 35 were previously cancelled. Claims 1-22, 24-34, 36, and 37 stand rejected and are appealed.

Status of Amendments

All amendments have been entered.

Summary of Claimed Subject Matter

As shown in Figure 1, this invention relates to a purification system 10 including a substrate 28 and a layered catalytic coating 40 applied on the substrate 28 (page 5, lines 9-16). The layered catalytic coating 40 includes a first layer 42 of a photocatalytic coating that is operative to react with a target substance to produce a first intermediate substance, a second layer 44 of a photocatalytic metal loaded metal compound coating that is operative to react with the first intermediate substance to form a second intermediate substance , and a third layer 46 of a thermocatalytic coating that is operative to react with the second intermediate substance to produce a product substance (page 5, paragraph 25, lines 1-12; page 8, paragraph 36, lines 1-5). This basic structure is set forth in Independent Claim 1.

Independent claim 22 recites a fluid purification system including a container 10 having an inlet 12 and an outlet 36, a porous substrate 28 inside the container 10, and a device 34 for drawing a fluid into the container 10 through the inlet 12, flowing the fluid through the porous substrate 28, and expelling the fluid out of the container 10 through the outlet 36 (page 5, paragraph 24, lines 1-8). A layered catalytic coating 40 is applied on the substrate 28, and the layered catalytic coating 40 includes a first layer 42 of a photocatalytic metal oxide coating, a second layer 44 of a photocatalytic noble metal loaded metal oxide coating, and a third layer 46 of a thermocatalytic coating, and the third layer 46 is gold/metal oxide (page 5, paragraph 25, lines 1-12; page 8, paragraph 36, lines 1-5). An ultraviolet light source 32 activates the layered catalytic coating 40, and photons from the

ultraviolet light source 32 are absorbed by the layered catalytic coating 40 to form a reactive hydroxyl radical, and the reactive hydroxyl radical oxidizes contaminants in the fluid that are adsorbed onto the layered catalytic coating 40 when activated by the ultraviolet light source 32 to water and carbon dioxide in the presence of water and oxygen (page 5, paragraph 26, lines 1-6).

Independent claim 24 recites a purification system 50 including a first substrate 52 having a first coating of one of titanium dioxide and metal compound/titanium dioxide, a second substrate 54 having a second coating of metal/titanium dioxide, and a third substrate 56 having a third coating of metal oxide/titanium dioxide (page 10, paragraph 48, lines 1-12).

Independent claim 28 recites a method of purification including the steps of applying a layered catalytic coating 40 on a substrate 28, wherein the layered catalytic coating 40 includes a first layer 42 of a photocatalytic coating that is operative to react with a target substance to produce a first intermediate substance, a second layer 44 of a photocatalytic metal loaded metal compound coating that is operative to react with the first intermediate substance to form a second intermediate substance, and a third layer 46 of a thermocatalytic coating that is operative to react with the second intermediate substance to produce a product substance, and activating the layered catalytic coating 40 (page 5, paragraph 25, lines 1-12; page 8, paragraph 36, lines 1-5).

Grounds Of Rejection To Be Reviewed On Appeal

I. Whether claims 1-21, 28-30, 34, 36, and 37 are properly rejected under 35 U.S.C. §112, First Paragraph as failing to comply with the enablement requirement (first grounds).

II. Whether claims 1-21, 28-30, 34, 36, and 37 are properly rejected under 35 U.S.C. §112, First Paragraph as additionally failing to comply with the enablement requirement (second grounds).

III. Whether claims 1-21, 28-30, 34, 36, and 37 are properly rejected under 35 U.S.C. §112, First Paragraph as failing to comply with the written description requirement.

IV. Whether claims 22 and 31 are properly rejected under 35 U.S.C. §103(a) as being unpatentable over Kobayashi, et al. (U.S. 6,368,668, hereafter "Kobayashi") in view of Reisfeld, et al. (U.S. 2003/0021720, hereafter "Reisfeld").

V. Whether claims 24-27, 32, and 33 are properly rejected under 35 U.S.C. §103(a) as being unpatentable over Reisfeld in View of Kobayashi.

Arguments

I. Rejection of Claims 1-21, 28-30, 34, 36, and 37 Under 35 U.S.C. §112, First Paragraph (Ground 1)

The Examiner argues that the specification fails to enable whether the intermediates recited in the claims are formed from the oxidation of the target substance with the coating of the first layer or from the oxidation of another target substance with the coating of the second layer. The test for enablement is whether the specification contains sufficient information to enable one of skill in the art to make and use the claimed invention without *undue experimentation*. The initial burden lies with the Examiner to establish that undue experimentation would be required. However, the rejection does not consider undue experimentation or provide any explanation of how an unreasonable amount of experimentation would be required to practice the claimed invention. Therefore, the rejection does not establish *prima facie* lack of enablement and should be reversed.

II. Rejection of Claims 1-21, 28-30, 34, 36, and 37 Under 35 U.S.C. §112, First Paragraph (Ground 2)

The Examiner argues that the specification does not enable all of the Group VIII metals, such as rhodium. The test for enablement is whether the specification contains sufficient information to enable one of ordinary skill in the art to make and use the claimed invention without *undue experimentation*. The initial burden lies with the Examiner to establish that undue experimentation would be required. However, the rejection does not appear to consider undue experimentation or provide any explanation of how an unreasonable amount of experimentation would be required to practice the claimed invention. For this reason alone, the rejection should be reversed.

Additionally, since the specification teaches (see paragraph 31) that Group VIII metals, such as rhodium, ruthenium, palladium, iridium, osmium, or platinum can be used in the intermediate

layer 44, there is no basis for concluding that undue experimentation would be required to use the listed Group VIII metals in the intermediate layer. The listing of the Group VIII metals in paragraph 31 suggests that all of these Group VIII metals would oxidize the intermediate substance, as recited in the claims. For this additional reason, the specification is enabling and the rejection should be reversed.

III. Rejection of Claims 1-21, 28-30, 34, 36, and 37 Under 35 U.S.C. §112, First Paragraph

The Examiner argues that the claim limitation of the reaction between the third layer and the second intermediate substance is new matter that is not supported in the specification. Respectfully, Appellant disagrees because the specification includes at least one example (see paragraphs 32 and 37) illustrating that the intermediate layer oxidizes contaminants to produce carbon dioxide and that the inner layer (a third layer) oxidizes carbon dioxide. Therefore, in at least one example, the inner layer would oxidize the carbon dioxide produced from the intermediate layer, as claimed. For this reason, the claims do not include new matter and the rejection should be reversed.

IV. Rejection of Claims 22 and 31 Under 35 U.S.C. §103(a) Over Kobayashi in View of Reisfeld

The rejection does not establish motivation for modifying Kobayashi (base reference) with Reisfeld (secondary reference). In the Final Office Action of 14 May 2007 (page 5), the Examiner argues that "the motivation or benefit from the proposed modification would be the application of Kobayashi's photocatalytic material to Reisfeld's air purification in the enhancement of the photocatalytic oxidation of organic compounds in the air stream." Thus, the stated motivation is for modifying Reisfeld with Kobayashi's photocatalytic material, not for modifying Kobayashi with Reisfeld. Therefore, the given motivation does not establish *prima facie* obviousness, and the rejection should be reversed.

V. Rejection of Claims 24-27, 32, and 33 Under 35 U.S.C. §103(a) Over Reisfeld in View of Kobayashi

(i) Claims 24-27, 32, and 33

The Examiner argues (see page 5, last paragraph of the final office action) that the motivation for combining the cited references to meet the claimed arrangement would be "enhancing the photocatalytic oxidation of organic compounds in the air stream" of Reisfeld. The given motivation is merely a solution that the Examiner hopes to achieve by making the proposed combination rather than a reason that would prompt one of ordinary skill to provide the particular claimed arrangement. For this reason, the rejection does not establish obviousness and should be reversed.

(ii) Claim 27

In addition to the reasons discussed above, claim 27 would be allowable if rewritten in independent form. The Examiner argues that the claimed order of the substrates would be obvious since there is no unexpected results from the claimed order and that Kobayashi's substrates (which do not meet the claimed order), though general and random, would be equivalent in function to the claimed order of the substrates. The Examiner further argues that rearrangement of parts has been held to be obvious.

The given reasoning that Kobayashi's substrates could be arranged, through randomness, to meet the claimed order is not proper motivation under an obviousness rejection. Mere rearrangement without motivation for the particular claimed arrangement of layers is not sufficient to establish obviousness (MPEP 2144.04(VI)(C)). The rejection does not establish any motivation for choosing the particular claimed arrangement. For this reason, the rejection should be reversed.

Regarding unexpected results, Appellant notes that evidence of unexpected results may be used to overcome *prima facie* obviousness. An applicant is not required to provide unexpected results for patentability and certainly is not required to provide unexpected results in absence of *prima facie* obviousness. For this reason, the rejection is based on improper grounds and should be withdrawn.

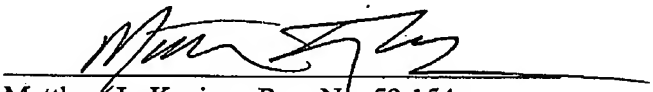
Additionally, the Examiner's speculation that the order of Kobayashi's substrates would be equivalent in function to the claimed order of the substrates lacks an evidentiary basis and does not appear to have any relevance in an obviousness rejection. The inquiry under this obviousness rejection is whether there is motivation to modify the base reference to meet the limitations of the claim, which there is not. For this additional reason, the rejection is based on improper grounds and should be reversed.

CLOSING

For the reasons set forth above, the rejection of claims 1-22, 24-34, 36, and 37 should be reversed.

Respectfully Submitted,

CARLSON, GASKEY & OLDS, P.C.



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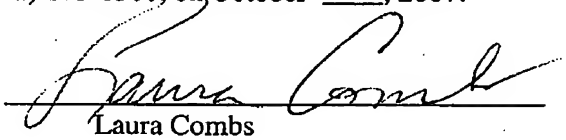

Laura Combs

CLAIM APPENDIX

1. A purification system comprising:

a substrate; and

a layered catalytic coating applied on said substrate, wherein said layered catalytic coating comprises a first layer of a photocatalytic coating that is operative to react with a target substance to produce a first intermediate substance, a second layer of a photocatalytic metal loaded metal compound coating that is operative to react with the first intermediate substance to form a second intermediate substance, and a third layer of a thermocatalytic coating that is operative to react with the second intermediate substance to produce a product substance.

2. The purification system as recited in claim 1 wherein said first layer is one of titanium dioxide and a metal compound loaded titanium dioxide.

3. The purification system as recited in claim 2 wherein said first layer is a metal compound loaded titanium dioxide coating and said metal compound is at least one of WO_3, ZnO, CdS, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, Co_3O_4, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2.

4. The purification system as recited in claim 1 wherein said first layer has a thickness less than 2 μm.

5. The purification system as recited in claim 1 wherein said second layer is a catalytically active metal supported on titanium dioxide.

6. The purification system as recited in claim 5 wherein said catalytically active metal is one of a metal alloy and an intermetallic compound supported on said titanium dioxide.

7. The purification system as recited in claim 5 wherein said catalytically active metal is a Group VIII noble metal.

8. The purification system as recited in claim 7 wherein said Group VIII noble metal is one of rhodium, ruthenium, palladium, iridium, osmium, and platinum.

9. The purification system as recited in claim 5 wherein said catalytically active metal is one of silver and rhenium.

10. The purification system as recited in claim 1 wherein said second layer oxidizes low polarity organic molecules.

11. The purification system as recited in claim 1 wherein said third layer comprises gold on a metal oxide, and said metal oxide is one of titanium dioxide, mixed metal oxides including titanium dioxide, and titanium dioxide loaded with a second metal oxide.

12. The purification system as recited in claim 11 wherein said third layer oxidizes carbon monoxide.

13. The purification system as recited in claim 1 wherein said third layer is applied on said substrate, said second layer is applied on said third layer, and said first layer is applied on said second layer.

14. The purification system as recited in claim 1 further comprising a manganese oxide/metal oxide layer applied on said substrate, and said third layer is applied on said manganese oxide/metal oxide layer, said second layer is applied on said third layer, and said first layer is applied on said second layer.

15. The purification system as recited in claim 14 wherein said manganese oxide/metal oxide layer is manganese oxide and a promoter doped manganese oxide/titanium dioxide.

16. The purification system as recited in claim 14 wherein manganese oxide/metal oxide layer decomposes ozone.

17. The purification system as recited in claim 1 further comprising a light source to activate said layered catalytic coating, wherein said layered catalytic coating oxidizes contaminants that are adsorbed onto said layered catalytic coating when activated by said light source.

18. The purification system as recited in claim 17 wherein said light source is an ultraviolet light source.

19. The purification system as recited in claim 17 wherein photons from said light source are absorbed by said layered catalytic coating, forming a reactive hydroxyl radical that oxidizes said contaminants in the presence of oxygen and water, and said reactive hydroxyl radical oxidizes said contaminants to water and carbon dioxide.

20. The purification system as recited in claim 17 wherein said contaminants are at least one of a volatile organic compound and a semi-volatile organic compound including at least one of aldehyde, ketone, alcohol, aromatic, alkene, and alkane.

21. The purification system as recited in claim 1 wherein said first layer, said second layer and said third layer are porous.

22. A fluid purification system comprising:

a container having an inlet and an outlet;

a porous substrate inside said container;

a device for drawing a fluid into said container through said inlet, flowing said fluid through said porous substrate, and expelling said fluid out of said container through said outlet;

a layered catalytic coating applied on said substrate, and said layered catalytic coating includes a first layer of a photocatalytic metal oxide coating, a second layer of a photocatalytic noble metal loaded metal oxide coating, and a third layer of a thermocatalytic coating, and said third layer is gold/metal oxide; and

an ultraviolet light source to activate said layered catalytic coating, and photons from said ultraviolet light source are absorbed by said layered catalytic coating to form a reactive hydroxyl radical, and said reactive hydroxyl radical oxidizes contaminants in said fluid that are adsorbed onto said layered catalytic coating when activated by said ultraviolet light source to water and carbon dioxide in the presence of water and oxygen.

24. A purification system comprising:

a first substrate having a first coating of one of titanium dioxide and metal compound/titanium dioxide;

a second substrate having a second coating of metal/titanium dioxide; and

a third substrate having a third coating of metal oxide/titanium dioxide.

25. The purification system as recited in claim 24 wherein said first coating is metal compound/titanium dioxide, said second coating is gold/titanium dioxide, and said third coating is manganese oxide/titanium dioxide.

26. The purification system as recited in claim 24 wherein a metal oxide of said metal oxide/titanium dioxide is at least one of WO_3, ZnO, $SrTiO_3$, Fe_2O_3, V_2O_5, SnO_2, $FeTiO_3$, PbO, $Co_3O[[4]]_4$, NiO, CeO_2, CuO, SiO_2, Al_2O_3, Cr_2O_3, and ZrO_2

27. The purification system as recited in claim 24 wherein said third substrate is distal to an inlet of said purification system, and said first substrate and said second substrate are proximate to said inlet of said purification system.

28. A method of purification comprising the steps of:

applying a layered catalytic coating on a substrate, wherein said layered catalytic coating comprises a first layer of a photocatalytic coating that is operative to react with a target substance to produce a first intermediate substance, a second layer of a photocatalytic metal loaded metal compound coating that is operative to react with the first intermediate substance to form a second intermediate substance, and a third layer of a thermocatalytic coating that is operative to react with the second intermediate substance to produce a product substance; and

activating said layered catalytic coating.

29. The purification system as recited in claim 1 wherein said substrate is a honeycomb.

30. The purification system as recited in claim 2 wherein said first layer is a metal compound loaded titanium dioxide coating and said metal compound is manganese oxide.

31. The fluid purification system as recited in claim 22 wherein said porous substrate is a honeycomb.

32. The purification system as recited in claim 24 wherein each of said first substrate, said second substrate and said third substrate are a honeycomb.

33. The purification system as recited in claim 24 wherein a metal oxide of said metal oxide/titanium dioxide is manganese oxide.

34. The method as recited in claim 28 wherein said substrate is a honeycomb.

36. The purification system as recited in claim 24, wherein the first coating, the second coating, and the third coating cooperate to react with a target substance to form a product substance.

37. The purification system as recited in claim 24, wherein the first coating is operative to react with a target substance to form a first intermediate substance, the second coating is operative to react with the first intermediate substance to form a second intermediate substance, and a third coating is operative to react with the second intermediate substance to form a product substance.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.